Replacement sheet

From Step-e ──Yes──▶ STOP

Calculate line flows and Output Q-generation at PV-nodes & tap-changing trans. Turns ratios

No

f Compute [RP] using eqn. (7) for PQ-nodes and using eqns. (11) and (16) for PV-nodes

g Solve eqn. (3) for $[\Delta\theta]$ & update angles by, $[\theta] = [\theta] + [\Delta\theta]$

h Set voltage magnitudes of PV-nodes to the specified values Increment ITRP=ITRP+1 and r=(ITRP+ITRQ)/2

i Compute ΔP_i^r & ΔQ_j^r, where i=1,.., (m+k) and j=1,..,m

i Is $\Delta P_i^r < \varepsilon$ & $\Delta Q_j^r < \varepsilon$?, where i=1,..,(m+k) and j=1,..,m   **Yes** **n**

No

j Compute [RQ] using eqn. (8) for only PQ-nodes

k Solve eqn. (5) for $[\Delta V]$, update voltages by $[V] = [V] + [\Delta V]$ In solving (5), skip rows and columns corresponding to PV-nodes

l If Q-limit of a PV-node or tap-limit of a tap-changing transformer violated, adjust the loadflow solution by limiting to violated limits

To Step-e ◀── **m** Increment ITRQ=ITRQ+1 & r=(ITRP+ITRQ)/2

Fig.1: **Prior Art: Flow-chart of Fast Super Decoupled**
(Cont.) **Loadflow (FSDL) method**

Replacement sheet

From Step-e

Yes → Calculate line flows and Output Q-generation at PV-nodes & tap-changing trans.

STOP   **n**

No

ff

Compute [RP] using eqn. (33) for PQ-nodes

i Compute $\Delta r_i \propto \Delta Q_j$, where i=1,..,(m+k) and j ,..,m

i Is $\Delta P_i^r < \varepsilon$ & $\Delta Q_j^r < \varepsilon$?, where i=1,..,(m+k) and j=1,..,m   **Yes**

No

j Compute [RQ] using eqn. (34) for only PQ-nodes

k Solve eqn. (5) for [ΔV], update voltages by [V] = [V] + [ΔV] In solving (5), skip rows and columns corresponding to PV-nodes

l If Q-limit of a PV-node or tap-limit of a tap-changing transformer violated, adjust the loadflow solution by limiting to violated limits

To Step-e ← **m** Increment ITRQ=ITRQ+1 & r=(ITRP+ITRQ)/2

Fig.2:Invention: Flow-chart of Super Super Decoupled
(Cont.)   Loadflow (SSDL-YY) method

Replacement Sheet

```
                          ┌─────────────────┐
                          │ Calculate line  │
                        n │ flows and       │
                          │ Output Q-       │
┌──────────────┐   Yes    │ generation at PV-│        ┌────────┐
│ From Step-e  │─────────▶│ nodes & tap-    │───────▶│  STOP  │
└──────────────┘          │ changing trans. │        └────────┘
       │   No             │ Turns ratios    │
       │                  └─────────────────┘
       ▼
┌────────────────────────────────────────────────────────┐
│     Compute [RQ] using eqn. (73), and solve (68). While │
│ fff   solving (68), skip all the rows and columns       │
│     corresponding to PV-nodes. Compute [RP] using eqn.  │
│         (74) or (75), and (76)  to solve (70)           │
└────────────────────────────────────────────────────────┘
                          │
                          ▼
┌────────────────────────────────────────────────────────┐
│     Update PQ-node magnitudes using [V] = [V] + [ΔV]    │
│ ggg Update PQ-node and PV-node angles using [θ] = [θ] + [Δθ]│
│                                                         │
│ l     and tap-position limit of any tap-changing transformer,│
│     adjust the loadflow solution by restricting to violated limits│
└────────────────────────────────────────────────────────┘
                          │
                          ▼
┌──────────────┐    m  ┌────────────────────────┐
│  To Step-e   │◀──────│  Increment ITR=ITR+1    │
└──────────────┘       └────────────────────────┘
```

Fig.3:Invention: Flow-chart of Super Super Decoupled
(Cont.)   **Loadflow (SSDL-BGX') method**

Replacement sheet

n — Calculate line flows and Output Q-generation at PV-nodes & tap-changing trans. Turns ratios

From Step-e — Yes →

No

STOP

ffff — Compute [RQ] using eqn. (91), and solve (68). While solving (68), skip all the rows and columns corresponding to PV-nodes. Compute [RP] using eqn. (92), (93), (80) and (29) to solve (70)

ggg — Update PQ-node magnitudes using $[V] = [V] + [\Delta V]$
Update PQ-node and PV-node angles using $[\theta] = [\theta] + [\Delta\theta]$
Set voltage magnitudes of PV-nodes equal to the specified

l — In case of violation of Q-limit of any PV-node generator and tap-position limit of any tap-changing transformer, adjust the loadflow solution by restricting to violated limits

To Step-e

m — Increment ITR=ITR+1

Fig.4: **Invention: Flow-chart of Super Super Decoupled**
(Cont.) **Loadflow (SSDL-X'G$_{pv}$X') method**